Items #64: Local Population Trend of Water Howellia

Purpose: This monitoring item was established to evaluate short and long term trends of water howellia (*Howellia aquatilis*), a federally threatened plant species occurring in the Swan Valley (Swan Lake Ranger District).

Methods: Transects were sampled annually to detect frequency and canopy cover. These data document the relationship between hydrologic regime and water howellia abundance and frequency. However, it was determined that the sampling design did not provide adequate data to infer population trends.

In 1998, a 10-year monitoring plan was implemented to detect changes in species distribution and abundance. This study helped evaluate if current management prescriptions for water howellia are sufficient for continued viability of the Swan Valley metapopulation (Table 64-1). The final sampling of the 10-year monitoring plan was conducted in 2007.

Table 64-1. Element Occurrence by Ownership of Water Howellia

State	County	Ownership	No. of Occurrences
Montana 154 total	Lake/Missoula	Forest Service	94*
		Forest Service/Plum Creek Timber Co.**	4
		Forest Service/The Nature Conservancy**	1
		The Nature Conservancy	4
		Plum Creek Timber Co.	31
		State of Montana	2
		State of Montana/ Plum Creek Timber Co.**	1
		Private	17
		Total	154

* All occurrences updated 7 February 2008, from data by the Montana Natural Heritage Program. ** Occupied wetland crosses ownership boundary.

Sixty-eight ponds, known to have water howellia, were annually monitored from 1998 through 2007 (Table 64-2). Four of these ponds, located on Plum Creek Timber lands, were monitored by the Swan Valley Ecosystem Center volunteers. Ponds were divided into (approximated) 0.25-acre sections. Presence/absence and abundance were recorded for each 0.25-acre section and within the each pond. Average pond size is about 0.75 acres and ponds averaged two sections per pond. The majority of ponds have one section, while a few others may have as many as 8 or 10 sections. In addition, relative abundance rating was assigned for each 0.25-acre section (Table 64-3).

Table 64-2. Water Howellia and Reed Canarygrass Monitoring Ponds List by Element Occurrence Pond Numbers

Occupied ponds				Unoccupied ponds			
				Monitored in ODD years		Monitored in EVEN years	
001	025	072	095	u-001	u-067	u-002	u-049
006	026	073	096	u-003	u-072	u-004	u-055
007	027	074	097	u-009	u-074	u-005	u-062
008	037*	075	098	u-014	u-075	u-006	u-065
009	043	076	099	u-015	u-076	u-007	u-068
010	044	078	100	u-025	u-077	u-011	u-070
012	045	079	101	u-027	u-085	u-012	u-071
013	047	080	102	u-046	u-092	u-013	u-086**
014	048	081	103	u-048	u-095	u-016	u-087**
015	054*	084	104	u-051	u-096	u-019	u-088
016	055	086	106	u-056	u-097	u-020	u-089
018	056	087	107	u-057	u-098	u-021	u-090**
019	057	090	108	u-064		u-047	u-091
020	061	091	109				
022	062	092*	111				
023	070	093*	112				
024	071	094	113				

* ponds on Plum Creek Timber lands;
** u-086, u-087, u-090 dropped from monitoring in 2002.

Table 64-3 Abundance Classes for Water Howellia in 0.25-acre Pond Sections

Abundance Classes	No. of plants per section
0	No plants found
L - Low	1-50 plants
M - Moderate	50-100 plants
H - High	>100 plants

Frequency and abundance were compared to annual precipitation for the water years prior to germination. Precipitation data from weather stations (Bigfork, Seeley Lake, and Lindberg Lake), in close proximity to the Swan Valley, were compiled from the National Oceanic and Atmospheric Administration. The water year prior to water howellia germination, is the period from October through September when germination occurs of the previous year. For example, 1998 monitoring data was compared to the annual precipitation for the water year of October 1996 through September 1997 (Figure 1).

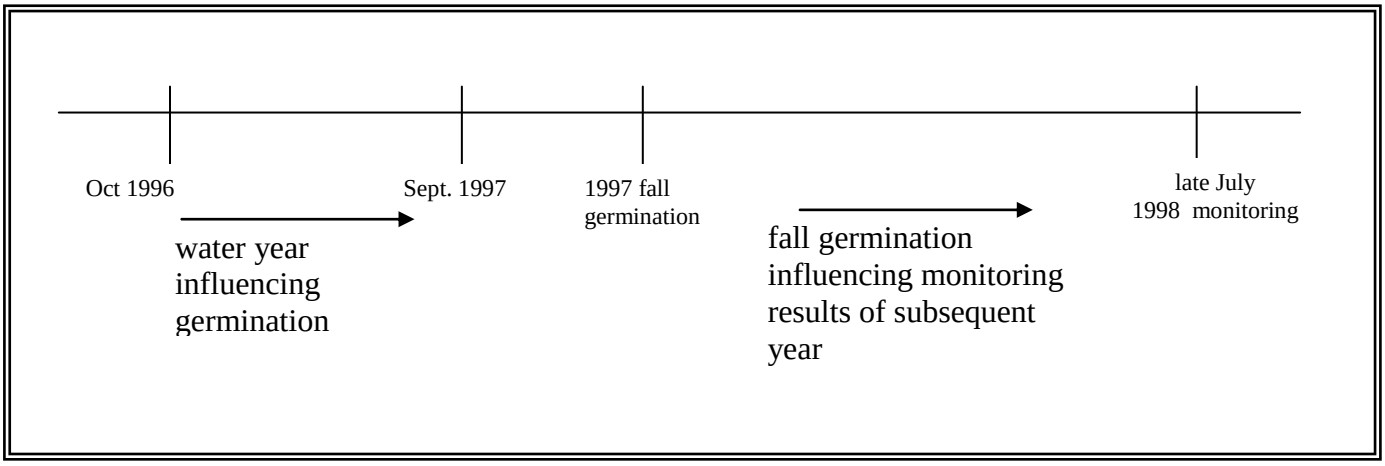


Figure 1. Water year Prior to Fall Germination Influencing Subsequent Year Summer Monitoring.

Results: With the exception of 2003, water howellia presence and abundance increased in both the ponds and 0.25-acre sections during the monitoring period of 1998 to 2007 (Table 4; Figure 2). Both presence and abundance decreased in 2003; however they remained higher than in 1998. Consistent with observations from Shelly (1998a), Lesica (1996), and the 1998 Monitoring and Evaluation Report (USDA Forest Service 1998); the six years of data from 1998-2003, indicate that water howellia frequency in the ponds and 0.25-acre sections are inversely correlated with precipitation for the water years prior to germination which means that the higher the precipitation, the fewer plants there are (Figure 1).

Table 64-4. Percent Frequency of Water Howellia (HOAQ) in Ponds and 0.25-acre Sections and Annual Precipitation From Water Year Prior to Germination at Nearby Weather Stations

Year	% frequency HOAQ in sections	% frequency HOAQ in ponds	Bigfork (inches) *	Seeley Lake (inches) *	Lindberg Lake (inches) *
1998	40	60	29.63	31.38	32.73
1999	62	82	24.98	22.39	23.1
2000	85	96	12.04	18.53	20.39
2001	79	94	18.17	16.52	21.32
2002	82	96	18.48	17.49	17.05
2003	51	64	20.18	19.08	24.04
2004	89	95	15.77	17.3	20.66
2005	85	94	21.83	22.21	21.12
2006	80	97	15.68	18.27	18.42
2007	82	94	20.11	19.84	23.16

* Weather station annual precipitation from October through September of previous year (see Figure 1).

Figure 2.

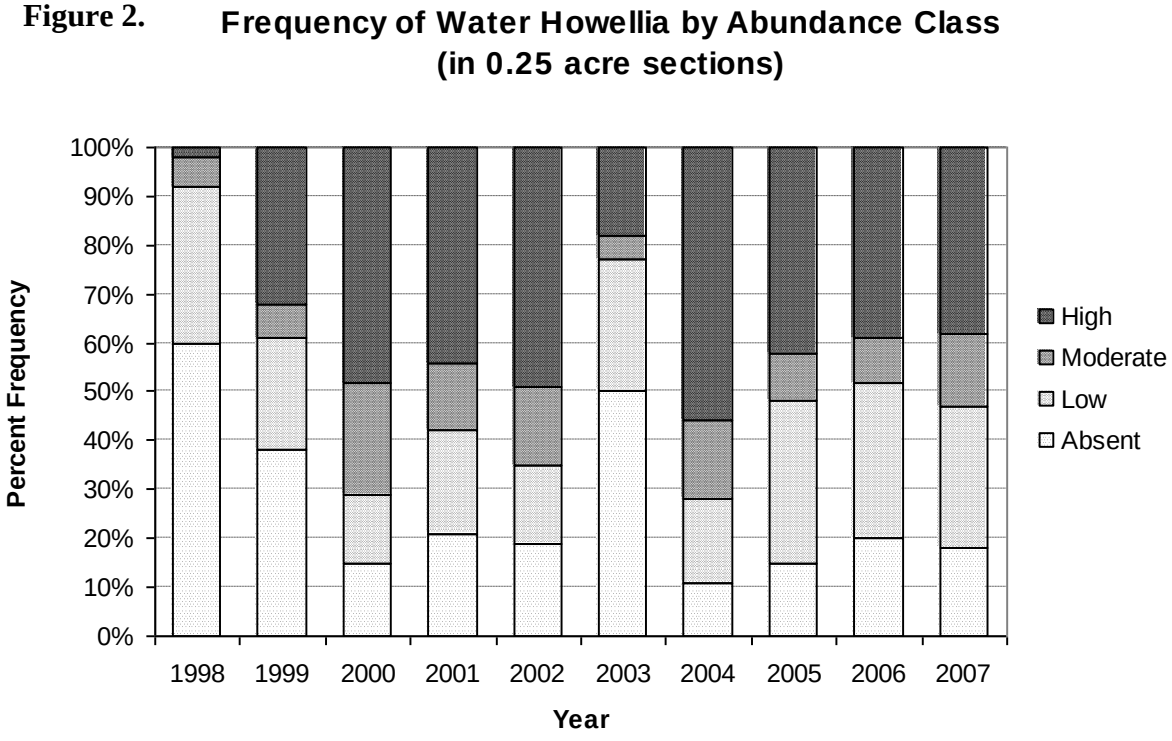
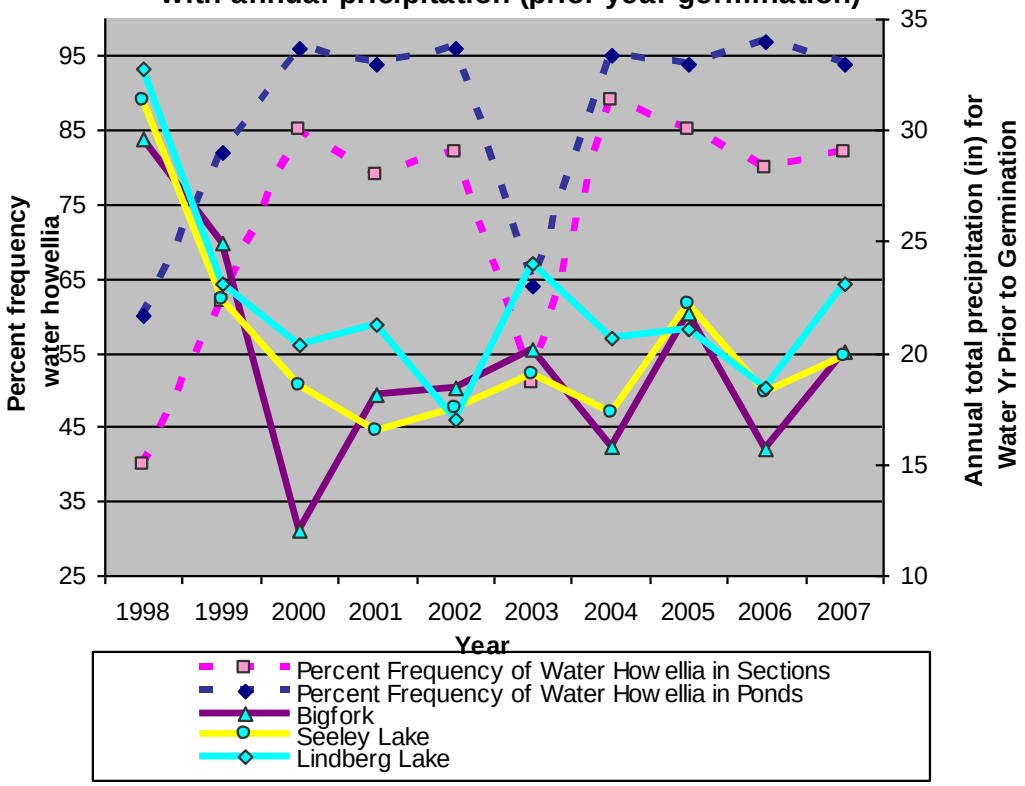

Frequency of Water Howellia by Abundance Class
(in 0.25 acre sections)
Percent Frequency
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
Year
High
Moderate
Low
Absent

Figure 3. **Frequency of water howellia plotted with annual pricipitation (prior year germination)**



Evaluation: Monitoring data indicate that annual water howellia frequency and abundance within ponds and 0.25-acre sections is inversely correlated with annual precipitation of the water year prior to germination. In 2000, water howellia frequency and abundance increased from the previous two years of monitoring. This correlated with water year preceding the fall germination for the 2000 monitoring year (Oct. 1998 through Sept. 1999). The inverse correlation was detected in the 1998 and 2003 monitoring year, where prior year precipitation was slightly higher than other years, and abundance and frequency of water howellia were lower.

Frequency and abundance had the highest correlation with precipitation data for the Lindberg Lake weather station. This station is the closest station to the water howellia ponds. Bigfork weather station is approximately 20 miles to the north of the nearest pond and Seeley Lake weather station is about 12 miles to the south.

Reproductive success of water howellia is directly linked with the fluctuation of water levels both annually and from year to year (Lesica 1990). Water howellia produce seeds underwater early in the growing season when ponds fill up and also produce seeds later in the season via above-water flowers. Water howellia requires annual drying of ponds for fall germination. However, repeated annual premature drying of ponds may reduce the ability for water howellia to replenish the seed bank from year to year. In addition, prolonged inundation of ponds in a

given year may reduce fall germination and result in reduced seed bank replenishment. The longevity of seed bank viability is not well understood. Some studies indicate that seed can retain viability for up to two years (M. Mantas, The Nature Conservancy, and J.S. Shelley, US Forest Service, unpub. data).

Recommendations: This 10-year monitoring detected trends but did not provide significant data. Continued monitoring on a three to five year cycle is recommended to detect significant changes in populations trends detected from this 10-year monitoring.